

Mitigation Plan Project Descriptions

Poseidon's Marine Life Mitigation Plan (MLMP) consists of five separate mitigation projects that are intended to mitigate for the unavoidable impacts of the proposed Huntington Beach Desalination Plant (HBDP). The five mitigation projects are:

- Bolsa Chica Ocean Inlet Maintenance & Preservation
- Bolsa Chica Intertidal Shelf Restoration
- Bolsa Chica Muted Tidal Basin Restoration
- Bolsa Chica Muted Tidal Basin Water Circulating System Enhancement
- Palos Verdes Rocky Reef Restoration

Bolsa Chica Inlet Maintenance & Preservation

Historically, thousands of acres of highly productive saltwater and freshwater marshes were part of a vital coastal ecosystem that extended from Anaheim Bay to the Huntington Beach bluffs, including 2,300 acres of the Bolsa Chica Lowlands. By 1900, the ocean inlet had been cut off, destroying the tidal nature of the wetlands. In the 1940s, oil production began in Bolsa Chica. The oil drilling rigs that dominated the area remain today. In 1973, the State Lands Commission (SLC) acquired about 330 acres in Bolsa Chica through a title settlement agreement. Then, between 1996 and 2005, SLC acquired about 950 additional acres. In 1996, SLC entered into an agreement with three state and four federal agencies to plan, design, construct, and maintain the Bolsa Chica Lowlands Restoration Project. The project was initially funded by the Port of Long Beach and Port of Los Angeles as mitigation for impacts from placing fill in San Pedro Bay to develop new terminals at the ports. In total, over \$151 million has been invested in the restoration and operation of the project. Restoration of the degraded wetlands was completed in 2006 and a new tidal inlet opened that restored tidal influence to the wetlands. This restoration is the largest coastal wetland restoration in Southern California's history. A second phase is planned but is on hold until oil production at Bolsa Chica ends.

Today, Bolsa Chica is an approximately 1,341-acre coastal estuary located in Huntington Beach, California that provides critical habitat to over 1,100 species, including more than 65 different fish species, 321 of Orange County's 420 different bird species, and a dynamic ecosystem with five major plant communities. These numbers include 50 different endangered fish and wildlife species that are present in Bolsa Chica. Approximately 30,000 people visit the reserve each year for recreational activities, educational tours and wildlife watching. The property is owned by the California State Lands Commission (SLC) and managed by the California Department of Fish and Wildlife (CDFW). Within Bolsa Chica, the Full Tidal Basin (FTB) includes 317 acres that were restored as fully tidal habitat and require tidal exchange to function and provide ecological value to marine fish. The tidal inlet at Bolsa Chica was designed to allow for tidal exchange for the initial restoration phases as well as future expansion of tidal action once oil production ceases in other portions of the property. The jetties were designed to allow for sand bypass and beach user access at low tide. These additional factors have resulted in higher maintenance requirements as sand accumulates within the tidal basin. Since completion, the Bolsa Chica inlet has nearly closed once, and tidal exchange is muted due to sediment shoaling inside the inlet. This has resulted in a smaller volume of ocean water exchange during the tidal cycle, a narrower tidal range compared to unobstructed conditions, and lowered marine wetland functions. In addition, the 180 acres of Muted Tidal Basin (MTB) areas that are connected to the FTB do not fully drain when the inlet shoaling occurs, causing lowered water quality within these areas as well.

In 2009 and 2011, two dredging events restored full tidal connectivity at Bolsa Chica. In 2015, there was a partial dredging event that did not remove all the sediment from the sediment basin, yet managed to restore the full tidal range. Subsequent partial dredging events have continued since then. However, the SLC and CDFW do not have the funds needed to pay for continued inlet dredging. Without continued dredging, the inlet is likely to close completely. If closure were to occur, the FTB would be effectively isolated from the ocean and would no longer provide habitat for coastal marine fish, water quality would decline, and tidal marsh areas would become inundated. The MTB and its restored wetlands would also suffer degradation under a closed inlet condition as it would not drain fully during low tides.

From the SLC request for Bolsa Chica funding for Fiscal Year 2020-21: *“The Commission has been searching for alternative long-term funding sources, including grants, for many years without success. Without continued funding, the Commission will be unable to perform required management activities, leading to a seasonal accumulation of sand at the mouth of the ocean inlet and forcing its closure. Closure of the inlet would have catastrophic impacts to the wetland habitat, its endangered species, and other valuable public resources, resulting in a significant net loss to the state’s coastal wetlands and endangering the \$151 million investment; closure may also cause flooding in the adjacent neighborhood and a pre-existing on-site oil operation, a significant liability to the state.”*

In coordination with the SLC and CDFW, Poseidon proposes to maintain tidal connectivity by assuming long-term financial responsibility for, and management of, inlet dredging in conjunction with additional wetland restoration actions within the Bolsa Chica Ecological Reserve. Implementation of the MLMP will result in an overall gain in aquatic resource function and will assure long-term estuarine productivity of the wetland system.

Bolsa Chica Intertidal Shelf Restoration

The Bolsa Chica Restoration Plan includes an Intertidal Shelf (also referred to as the “cordgrass bench” or cordgrass shelf”) within the FTB that was designed to be suitable for cordgrass establishment. When constructed, it was graded to a sloping elevation range of approximately mean sea level (0.8 meters NAVD 88) to 1 meter NAVD88 with the intention that it would be exposed regularly during the tidal cycle. It is approximately 23 to 25 acres in size excluding the channels connecting to the muted tidal system. It was planned to support low marsh (e.g. cordgrass) that would provide suitable habitat for the Ridgeway’s Rail. However, it has remained barren despite a pilot cordgrass planting effort conducted in 2007 that established some cordgrass in the FTB, but failed to establish cordgrass on the Intertidal Shelf. The reason for the failure is thought to be due to the inlet shoal that restricts the FTB from draining low enough for cordgrass to survive. Cordgrass grows best when it is only inundated 20-40% of the time during a daily tidal cycle. Longer periods of inundation are detrimental and when the sill builds at the inlet due to lack of maintenance and dredging, it results in a longer duration of flooding. In addition, it has been suggested that wave action also affected the ability of cordgrass plantings to survive on the shelf.

Restoration of this area to support coastal salt marsh vegetation will require raising the elevation of the Intertidal Shelf to approximately 1.0 to 1.5 meters NAVD88 (3.5 to 5.1 ft MLLW). This elevation range is expected to support coastal salt marsh consisting of low marsh species such as cordgrass (*Spartina foliosa*) to high marsh species dominated by pickleweed (*Salicornia pacifica*) and other high marsh species. Based on our current understanding of the sill formation at the inlet, this range would allow for proper drainage as long as the inlet is maintained as anticipated under Poseidon’s proposal. The restored area will be designed to have a gradual change in elevation so that as sea levels rise, cordgrass habitat could “retreat” upslope in areas that are initially planned to support pickleweed. Because

cordgrass normally grows in a narrow band along the edge of natural salt marshes, the majority of the area would be initially planned for pickleweed habitat which is normally found at elevations that are inundated less than 20% of the time.

In addition to Ridgeway's Rail, coastal salt marsh provides habitat for Belding's savannah sparrow whose populations have been reduced in the MTB as tidal water has been impounded here. Between 2008 and 2011, that coastal salt marsh habitat declined by 50 acres, largely within the MTB. The restoration of the Intertidal Shelf would partially replace this important habitat in conjunction with other elements of Poseidon's plan to improve water circulation within the muted tidal basins. In addition, pickleweed has a high level of primary production which will contribute to the overall FTB productivity through the export of organic matter to the subtidal area. Studies have shown that small fish, such as California killifish (*Fundulus parvipinis*) were able to consume six times more food in marsh habitat than in habitat with no marsh access. Restoration of this area to coastal salt marsh will not only achieve the goal originally anticipated for this area but will also contribute to fish productivity of the system.

Poseidon is proposing to place and grade the additional sediment needed to raise the Intertidal Shelf and then plant it with cordgrass and pickleweed. The Intertidal Shelf is not serving the purpose that it was designed for and will be restored to serve a better ecological function.

Bolsa Chica Muted Tidal Basin (MTB) Restoration

There are two distinct components of this mitigation project: the Oil Pad/Berms/Road Areas Restoration and the Fieldstone Property Restoration

Oil Pad/Berms/Road Areas Restoration

Beginning in the 1960's, the Bolsa Chica wetlands were diked to support the extraction of oil. Roads were built for oil derricks and pipelines installed to collect and process the crude oil. As a result of the oil extraction, the land surface of the former wetlands subsided – in some cases below sea level. However, wetland habitats were still present in areas between the networks of roads. These wetland areas supported Belding's Savannah Sparrow habitat. When the initial restoration for Bolsa Chica was being designed, it was determined that some of these areas should be preserved to the extent possible to provide for continued use by the Belding's Savannah Sparrow, but could be partially flooded by tidal water under a dampened or muted tidal system. Three MTBs were created by connecting them to the FTB with culverts and then constructing channels within the MTBs to promote limited tidal exchange. Water circulation within and between the basins has been hampered by culverts and other physical constraints, resulting in poor water quality that has reduced habitat quality for fish and other aquatic life. In addition, there are a number of former oil production facilities and roads that were left within the muted tidal basins that are no longer used and could be converted to wetland habitat.

Currently, the MTBs contain active and inactive oil pads and roadways scattered throughout the area. These are upland areas that are largely barren. Removal of the inactive oil pads and roads will result in a net increase of approximately 1.2 acres within the muted tidal area and remove barriers to circulation within the MTBs. The areas would be graded and lowered to elevations suitable for subtidal, mudflat, and/or pickleweed habitat based on the surrounding habitat in that area. The type of habitat restored will be dependent upon the tidal range within each MTB. In addition, there may be other associated infrastructure, including pipelines that may need to be removed or relocated that are not currently present or evident.

Fieldstone Property Restoration

The Fieldstone Property is located along the northeastern boundary of the Bolsa Chica Ecological Reserve. It is connected to the Western MTB and the Central MTB through a number of culverts but is also divided into separate portions by internal berms. According to observations made during the site visit and discussions with CDFW staff, the tidal connectivity and water circulation is currently limited. During the initial restoration, several areas were graded to lower elevations and it was anticipated to become a vegetated marsh. However, these areas have remained barren and are infrequently inundated. It is likely that the culverts are undersized and/or blocked and larger culverts or levee breaches are needed to provide tidal inundation similar to that occurring within the Western MTB. In addition, areas that are connected to the Central MTB have restricted tidal exchange as the tidal gates at the FTB are blocked by accumulated sediment. Other areas may also need to have tidal channels excavated to improve tidal circulation or be lowered in order to provide open water habitat. The area of barren habitat is approximately 6 acres. Three subareas within the Fieldstone Property have the potential for restoration of the existing barren/salt panne areas to more productive vegetated or intertidal/subtidal habitat. The primary constraint appears to be inundation frequency due to the restricted tidal action. The soils within these areas consist of Bolsa silty clay loam and tidal flats. The primary restriction to plant growth in saline conditions and the barren areas have a salt crust over them. Considering buffers, slopes, and other constraints, it is assumed that up to 4.5 acres of wetland habitat (open water and/or vegetated habitat) could be restored.

Bolsa Chica Muted Tidal Basin (MTB) Water Circulating System Enhancement

The success of Poseidon's restoration projects in Bolsa Chica may require additional improvements to the water circulation within the MTBs other than those detailed above. These circulation improvements could take the form of changing the size or slope of tidal channels, modifying the existing tide gate, and/or other similar and related activities. The improvements would also be designed to provide capacity for the Bolsa Chica Steering Committee and CDFW to more effectively manage hydrology within the MTBs. Poseidon will submit additional plans for the proposed enhancements to the water circulation within the MTBs. The water circulation improvements are also expected to increase fish richness by helping to stabilize salinity, temperature, and dissolved oxygen conditions within the MTB waters.

Palos Verdes Rocky Reef Restoration

Approximately 17 miles west-northwest from the Bolsa Chica Ecological Reserve, are the remains of what was once a highly-productive natural rocky reef habitat offshore of the Palos Verdes Peninsula. Historic and recent landslides have since buried the rocky reef habitat between Abalone Cove and Point Fermin. The reef initially became buried on June 2, 1999 when the 18th hole of the Trump National Golf Club at Palos Verdes slid into the ocean. The cliff has since been dewatered to stabilize it, reducing the landslide potential, but the ecological impact to the reefs remains.

The NOAA Restoration Center/Montrose Settlements Restoration Program and State Coastal Conservancy recently funded the evaluation, permitting, design, placement, and construction of an artificial rocky reef at Bunker Point along the Palos Verdes Peninsula. Initial studies began on the project in 2009 and the reef completed construction in September 22, 2020. These studies identified that significant additional habitat exists between Bunker Point and the White Point Ocean Outfall that could be used for the creation of rocky reef habitat. This area lies within the area from Abalone Cove to Point Fermin that was impacted by the historic landslides. SLC granted a 133-acre lease to the Southern California Marine Institute (SCMI) encompassing the site of the initial artificial reef project and other areas suitable for artificial reef habitat creation should additional funding become available. The initial artificial reef covers 31.5 acres, which is composed of 6.83 acres of rock modules with the remainder being 25.5 acres of sand channels and reef halo within the lease area. There is approximately 49.9 acres

of additional area available within the existing 133-acre lease area available for artificial reef creation, with the remaining acreage consisting of functioning, natural rocky reef habitat. The artificial reef habitat area's close proximity to highly productive natural reefs and inshore giant kelp will likely produce more reef propagules to colonize the new reef quickly and suggests a high likelihood of success.

The artificial rocky reef habitat area is directly on top of the buried, non-functional natural reef which has minimal biological productivity, consistent with the soft-bottom habitat that dominates the San Pedro Shelf. The studies completed by SCMI and NOAA carefully determined a set of design criteria to mimic the high relief characteristics of the local natural reefs by creating rock modules of varied heights, all rising at least 1 meter above the seafloor to facilitate maximum fish utilization and production. The reef is constructed using large boulders of quarry rock from Santa Catalina Island, weighing at least one ton each, that, when placed together, create more voids in the reef which are critical to support the reef community. Voids provide fish and macroinvertebrates areas to hide and take refuge from larger reef predators. This design has been shown to dramatically increase fish production over what could be achieved with a low-relief reef constructed with smaller boulders. Smaller boulders settle more tightly and create less void space.

The spacing between the rock modules also provides multiple benefits including the halo effect where reefs more than 30 meters apart from one another operate as individual reefs for the resident species rather than a single reef. This is important as several reef species, such as California Sheephead, are territorial. A single male could more effectively control a single large reef than he could multiple smaller reefs in a complex such as the PVR. Another significant result of spacing the modules is to create ecotonal habitat. Ecotonal habitat is where the rocky reef ends and meets the soft bottom habitat. This area is highly productive for multiple species including the overfished Barred Sand Bass outside of their spawning season.

Poseidon is proposing the creation of approximately 41.3 acres of additional rocky reef habitat within the existing 133-acre lease by using the same design criteria as the initial artificial reef project in the lease area. This includes modules of quarried rock placed on the seafloor to construct high-relief rocky reef habitat. Actual relief is expected to vary between 3 – 4 meters to provide variable structure similar to the natural reefs in the area. Wide sand channels will be included to maximize the highly-productive boundary ecotonal habitat. The creation of additional rocky reef habitat along the Palos Verdes Peninsula would result in a suite of environmental benefits that include increased fish and macroinvertebrate density, biomass and production, suitable habitat for giant kelp recruitment and growth, and new habitat to support protected species including the federally-endangered white abalone, Giant Sea Bass, and other various abalone species as well as valuable gamefish such as Kelp Bass and Barred Sand Bass.